What is claimed is:

1. A film forming method comprising the steps of:

preparing a film forming gas, that consists of any one selected from a group consisting of alkoxy compound having Si-H bonds and siloxane having Si-H bonds and any one oxygen-containing gas selected from a group consisting of O_2, N_2O, NO_2, CO, CO_2, and H_2O; and

forming a silicon-containing insulating film on the substrate by plasmanizing the film forming gas to react.

2. A film forming method according to claim 1, wherein at least any one selected from a group consisting of N_2 and H_2 is added to the film forming gas.

3. A film forming method according to claim 1, wherein the alkoxy compound having Si-H bonds is formed of trimethoxysilane (TMS:$SiH(OCH_3)_3$).

4. A film forming method according to claim 1, wherein the siloxane having Si-H bonds is formed of tetramethyldisiloxane (TMDSO:$(CH_3)_2HSi\text{-}O\text{-}SiH(CH_3)_2$).

5. A film forming method according to claim 1, wherein parallel-plate type electrodes are employed as a plasma generating means, and, when a film is formed, a high frequency power having a frequency of 100 kHz to 1 MHz is applied to an electrode on which a substrate is loaded and a high frequency power having a frequency of 1 MHz or more is applied to an electrode opposing to the electrode on which the substrate is loaded.

6. A semiconductor device manufacturing method comprising the steps of:

preparing a substrate on a surface of which a wiring is formed; and

forming a silicon-containing insulating film for covering the wiring by plasmanizing a film forming gas, that consists of any one selected from a group consisting of alkoxy compound having Si-H bonds and siloxane having Si-H bonds and any one oxygen-containing gas selected from a group consisting of O_2, N_2O, NO_2, CO, CO_2, and H_2O, to react.

7. A semiconductor device manufacturing method according to claim 6, wherein the silicon-containing insulating film for covering the wiring is a protection layer.

8. A semiconductor device manufacturing method according to claim 7, further comprising the step of forming an interlayer insulating film, whose film thickness is thicker than the protection layer, on the protection layer, after the step of forming the protection layer for covering the wiring.

9. A semiconductor device in which a silicon-containing insulation film whose peak of an absorption intensity of an infrared rays is in a range of a wave number 2270 to 2350 cm^{-1}, whose film density is in a range of 2.25 to 2.40 g/cm^3, and whose relative dielectric constant is in a range of 3.3 to 4.3 is formed on a

substrate.

10. A semiconductor device according to claim 9, further comprising a wiring is formed on a surface of the substrate,

wherein the silicon-containing insulation film covering the wiring to come into contact with the wiring.

11. A semiconductor device according to claim 9, further comprising:

a wiring;

an insulating film that covers the wiring to come into contact with the wiring are formed on a surface of the substrate; and

an protection layer made of the silicon-containing insulation film formed on the insulating film.

12. A semiconductor device according to claim 9, further comprising:

a wiring formed on a surface of the substrate;

a lower protection layer that covers the wiring to come into contact with the wiring;

a main insulating film that is laminated on the lower protection layer to come into contact with the lower protection layer; and

an upper protection layer that is laminated on the main insulating film to come into contact with the main insulating film,

wherein both the lower protection layer and the upper protection layer are made of the

silicon-containing insulation film.

13. A semiconductor device according to claim 12, wherein the main insulating film is made of any one selected from the group consisting of an SiOF film and a porous insulating film.

14. A semiconductor device according to claim 9, further comprising:

an lower wiring;

a upper wiring; and

an interlayer insulating film interposed between the lower wiring and the upper wiring are formed on the substrate,

wherein the interlayer insulating film is made of the silicon-containing insulation film.

15. A semiconductor device according to claim 14, wherein the lower wiring and the upper wiring are connected via an opening portion formed to perforate the interlayer insulating film.

16. A semiconductor device according to claim 9, further comprising:

(i)a lower wiring formed on a surface of the substrate (20c);

(ii)an upper wiring; and

(iii)an interlayer insulating film interposed between the lower wiring and the upper wiring, the interlayer insulating film comprising

(a)a lower protection layer made of the

silicon-containing insulation film that covers the lower wiring to come into contact with the lower wiring,

(b)a main insulating film that is laminated on the lower protection layer to come into contact with the lower protection layer, and

(c)an upper protection layer made of the silicon-containing insulation film that is laminated on the main insulating film to come into contact with the main insulating film,

wherein both the lower protection layer and the upper protection layer are made of the silicon-containing insulation film.

17. A semiconductor device according to claim 16, wherein the main insulating film is any one selected from a group consisting of an SiOF film and a porous insulating film.

18. A semiconductor device according to claim 16, further comprising:

an opening portion formed to perforate the interlayer insulating film; and

a side-wall protection layer made of the silicon-containing insulation film is formed on a side wall of the opening portion,

wherein the lower wiring and the upper wiring are connected via the opening portion.